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Research Article

# Impact of Lockdown on Aquaculture in Assam and Role of Small Scale Family Fish Farming in Sustaining Family Nutrition During Lock Down

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## Abstract

Assam, one of the states of North East Region of India, is bestowed with enormous potential for fishery based industries. With a total population of 31,169,272 (Census 2011) comprising of fish eating ethnic population, the demand for fish in both and preserved form is very high in the state. Among all states of the region, Assam has the distinction of having vast water area with aquaculture potential and of being the highest fish producer (70%) in the region. Horizontal and vertical growth of aquaculture through implementation of several developmental scheme including the Blue Revolution Mission has resulted in steady growth of fish production in the state during the last decade, marching towards achieving the goal of self sufficiency. The lockdown imposed in the region to control spread of Covid-19 pandemic from 25th March, 2020, had tremendous impact not only on different activities related to the aquaculture resulting in livelihood crisis for fish farmers and all stake holders, but also on day-to-day essential nutrition for the fish loving population of the state. Homestead small scale family fish farming with sustainable low cost technology is the effective option to cope with the crisis brought by the lockdown situation in the region. This paper discusses the impact of the lockdown on different aspects vis a vis way forward to face the challenges and consequences of the impact of Covid 19 pandemic on the sector.

**Keywords:** Assam; Covid 19; Pandemic; NE Region; Impact; Aquaculture; Livelihood; Nutrition; Family Fish Farming

## Introduction

Family farms are the small scale farms that are managed and operated by a family and predominantly reliant on family labour. In recent years, family farms, have been gaining importance for securing nutrition for a large section of global population through small scale sustainable agricultural production. For achieving the Sustainable Development Goals (2015-2030) as envisaged and adopted by United Nations (UN), the promotion of small scale family farming has been regarded as an important move. Small and marginal farmers are the backbone of Indian Agriculture. According to the 10th Agriculture Census 2015-16, small and marginal farmers in India, accounts for around 86.2% of total farm holding and owns only 47.3% of total crop area of the country. Assam, the second largest and most populous state of NE region of India, has this unique distinction of having traditionally managed family farms, in almost all rural homesteads. Locally known as Bari, this age old family farming system typically includes a combination of different fruit plants, vegetables, plantation crops and livestock and birds like cattle, goat, pig, poultry, duck etc. in addition to a fish crop grown in small pond in the homestead [1]. While the diversified cropping system helps utilization of available land resources while providing required nutrition to farm family, a pond in the homestead acts as the water reserve for the family, harvesting rain water for domestic use, irrigation for crops and raising livestock as well as producing a fish crop. The economy of the state largely depends on agriculture and allied activities. Majority of the farming community are marginal farmers (operational land holdings below 1 ha) and small farmers (operational land holding 1.0-2.0 ha).

The North East Region of India, comprised of eight land locked states viz. Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim covers a total of 2.62 lakh sq.km area that accounts for 7.97% of total land area of the country. With a total population of 457,72,188 (around 4% of the country's population, Census 2011) comprising of around 220 ethnic communities, the region as a whole is known for its unique physiographic, agro-climatic, demographic and socio-economic features. The region is connected to the rest of the country through Assam via a narrow corridor known as the Chicken's neck. Inhabited by 90-100% fish eating population in component states, there is substantial demand in the region for both fresh fish and fish products [2]. Although there is steady growth in the sector, several inherent factors including annual devastating flood, heavy rainfall, low pH of soil and water, low temperature during winter etc. have been debarring the region from harnessing the full potentiality resulting in substantial gap in between production and domestic demand in different states, which is met by importing fish from other parts of the country as well as from neighbouring country like Bangladesh.

Among the different states of the Region, Assam (Figure 1) is in most advantageous position for developing aquaculture as a major industry as it is blessed with vast and varied water resources (total around 5.5 lakh ha) comprising of two major river systems the Brahmaputra and the Barak, myriads of flood plain wetlands, reservoirs, ponds, low lying paddy fields, swamps and derelicts (GoA, 2017) along with rich fish species biodiversity comprising of 311 species [3]. Factors like high demand for fish, suitable climate, available technology back up, direct linkage with rest part of the country through chicken's neck, export potentiality and available human resource support a congenial background for promoting aquaculture as a flourishing industry in the state [4]. Presently the state is the major producer of fish in the North East region contributing more than 70% fish to the Region's basket (Table 1). Horizontal and vertical growth of aquaculture through implementation of several developmental schemes including the Blue Revolution Mission has resulted in steady growth of fish production in the state during the last decade, marching towards achieving the goal of self sufficiency.

The COVID 19 pandemic created an unprecedented disruption to the life and livelihood of people of the region as a whole. To curb the spread of COVID 19 pandemic in the country, the Government

**Figure 1:** The study area, Assam, NE region of India.

of India initiated strict lock down on March 25, 2020 (Lockdown 1.0) for 21 days, which was later extended until June 08, 2020 in different phases and with different stringent restrictions. The COVID-19 lock down crisis came at a particularly pivotal time for fisheries and aquaculture sector in the region. Under culture sector, important activities like harvesting and marketing of table fish and carry over seed, culture pond preparation, stocking, brood stock raising, induced breeding and seed production are conducted normally during this period. Whereas in capture fisheries sector, spring catches of fish is done in natural resources during the month of March to compensate and cope with the ensuing monsoon ban on fishing commencing from 1st April, every year. With this background a study was undertaken to assess the impact of the lock down on the different activities of the aquaculture sector of the region with special reference to Assam.

**Figure 2:** Trend of fish production in Assam in last ten years.

| State | 2017-18 | 2018-19 | 2019-20 |
|---|---|---|---|
| Arunachal Pradesh | 0.04 | 0.05 | 0.05 |
| Assam | 3.27 | 3.31 | 3.73 |
| Manipur | 0.33 | 0.32 | 0.32 |
| Meghalaya | 0.12 | 0.13 | 0.14 |
| Mizoram | 0.08 | 0.07 | 0.07 |
| Nagaland | 0.09 | 0.09 | 0.09 |
| Sikkim | NA | NA | NA |
| Tripura | 0.77 | 0.7 | 0.78 |
| Total (lakh tones) | 4.7 | 4.67 | 5.18 |
| Assam's contribution | 69.6% | 70.9% | 72.0% |

**Table 1:** Fish production (lakh tonnes) in NE States in last 3 years.

Source Hand book of Fisheries Statistics 2020. Govt. of India.

## Materials and Methods

The study was conducted by collecting data through social media, telephonic conversation and online survey among three groups of respondents. viz. A. Fish farmers, B. Fish seed producers and C. Consumers, selected randomly from different districts of Assam during the first three lock down periods extending from 25th March to 17th May, 2020. The location of the study was Fisheries Research Centre, Assam Agricultural University, Jorhat, Assam, India, situated in between 26º48′ 296" N Latitude and 94º11′961" E Longitude.

## Results, Discussion and Conclusion

The impacts of lock down on different activities of aquaculture sector in Assam as recorded during the period, were compiled in table 2. It was observed that, majority of fish farms of the state suffered from lack of proper management and unavailability of essential inputs like lime, manure, fish feed etc. resulting in deterioration of water quality, weed infestation, disease and poor growth (Figure 3 and 4). Some farms recorded mortality of large size fishes ready for harvesting and sale resulting in financial loss due to water quality deterioration whereas some farms remain nonoperational due to lack of seeds for stocking in time, other essential inputs and proper preparatory measures. In seed production sector also, the seasonal activities of induced breeding and seed production during the peak breeding period that extends from April- May to June- July was acutely affected and the overall seed supply channel was disrupted. The sector as a whole had an unprecedented halt during a very productive time full of activities.

It was observed that there was disruption of fish supply chain from other states and countries to the region and the stakeholders of this supply chain system at different level were out of job and had suffered from acute financial crisis. In capture sector too, fishing activities suddenly came to a standstill affecting the livelihood of the aboriginal fisherman community. Closure of fishing activity and disruption of fish supply chain had led to uncertainty in availability of fish for the fish eating populations of the region. Sector wise responses of fish farmers as well as fish seed producers and growers were depicted in table which indicated the severity of impact of the lockdown on the life and livelihood of the people engaged in this sector. FAO [5] also expected to have negative consequences of the COVID 19 pandemic on fisheries monitoring, control and surveillance (MCS), R&D and production and management activities resulting in a major setback of this important food production sector throughout the globe. This will definitely have negative impact not only on the livelihood but also on the nutritional security of the fish eating population.

**Figure 3:** Cleaning of weed infestation in fish culture pond after lockdown in Assam.

The lockdown imposed to control spread of Covid-19 pandemic from 25th March, 2020, has tremendous impact not only on different activities related to aquaculture sector resulting in livelihood crisis for fish farmers, fishers and retailers but also on day-to-day essential nutrition for the fish eating population of the region. It has been observed that the traditional homestead family farming played an important role in providing sustenance to the farm family during lockdown. Homestead family fish farming practices could meet the day to day nutrition requirement in 87% of the respon-

| Lock Down chapter with restrictions imposed | Date with duration | Activities normally done during the period | Impact of Lockdown imposed restrictions | Resultant, impact on aquaculture |
|---|---|---|---|---|
| Lockdown-1: | | | | |
| Complete lockdown of all movement and all activities except the emergency activities related to medical urgency and security. | 25th March - 21st April, 2020. (28 days) | 1. Pond management.<br>2. Brood stock raising.<br>3. Induced breeding.<br>4. Carry over seed raising, seed disposal and stocking.<br>5. Fish harvesting and marketing.<br>6. Sale of fish seed at farm gate.<br>7. Transportation of fish seed.<br>8. Transportation of harvest for marketing/export.<br>9. Precautionary measure to mitigate flood impact in flood affected areas.<br>10. Intensive fishing in natural waters just before closure of fishing season w.e.f 1st of April every year | 1. Problem of mobility.<br>2. Input supply system hampered.<br>3. Table fish marketing hampered.<br>4. Transportation and sale of fish seed hampered.<br>5. Flood mitigation measures hampered.<br>6. Farm management/Pond management hampered<br>7. Preparatory measures for induced breeding and fish seed production hampered.<br>8. Fishing in natural waters is hampered in initial days due to different restrictions. | 1. Fish farmers/fish seed producers have suffered from acute financial crisis due to disruption of economic activities<br>2.Water quality deterioration, Weed infestation in culture ponds except in homestead small pond fish farming<br>3.Recorded fish mortality due to lack of proper management<br>4. Unavailability of fish for consumption except for families having family fish farming in homestead.<br>5. Unavailability of fish seed for stocking and other inputs,<br>6. Induced breeding and seed production hampered<br>7. Major set back in all fishing, and fish culture related activities |
| Lockdown-2.0: | | | | |
| 1. Partially resumed the official activities with partial attendance mobility (intra district) on emergency duty except in no inter district movement without permission and other protocols<br>2. Restrictions imposed on movement for agricultural and allied activities including fisheries have been removed partially.<br>3. Home delivery for agri product including fish resumed by observing social distancing and other protocol.<br>4. Farming operation in field, procurement of agricultural product, Machinery shop, Custom hiring centers, fertilizers and seed shops are allowed.<br>5. APMC Mandis, direct marketing operations, harvesting and sowing are allowed.<br>6. Operation of fishery like processing and sale, hatcheries, commercial aquaria are allowed to work with 50% workers. | 22nd April - 3rd May, 2020. (12 days) | 1. All as above. | 1. All as above.<br>2. Difficulties in harvesting, marketing, induced breeding and seed production with limited work force by maintaining social distancing<br>3. Restrictions in inter-district movement restricted all transportations of fish seed, table fish, input etc.<br>4. Along with Lock down, heavy pre monsoon rain causing pond management practices difficult | 1. Seed production sector could not be geared up as expected due to lack of timely<br>2. preparatory measures, unavailability of inputs like<br>3. hormone and Diesel.<br>4. Other activities could not be revamped due to the restrictions in mobility imposed as well as protocols of social distancing. Limitation of manpower etc.<br>5. Seed produced or kept from previous year could not be sold in due time<br>6. Mortality and loss of fish seed due to lack of proper management, feed etc<br>7. Unavailability of inputs for breeding, seed raising and grow out culture imported from other places hampered the activities |

| | | | | |
|---|---|---|---|---|
| Lockdown-3.0: | | | | |
| 1. Mobility partially resumed<br>2. Restrictions on Inter district/Interstate movement without permission and proper protocol<br>3. Market, gym mall school college closed<br>4. No movement to and from Red Zone/Orange Zone and Containment area.<br>5. All agricultural and allied sector are allowed to work the same as Lockdown-2. | 4th May - 17th May, 2020. (14 days) | 1. All as above. | 1. All as above<br>2. Along with Covid 19, initial flooding started during this lockdown period worsening the situation | 1. All as above<br>2. Flood related damage to the aquaculture sector across five districts<br>3. Loss of cultured fish and fish seed along with pond management issues due to lock down<br>4. Acute financial crisis for fish farmers, fish seed producers, retailers and other stake holders |

**Table 2:** Status of aquaculture of Assam during lockdown period due to COVID-19 pandemic.

dents having homestead fish farming. Low external input sustainable technologies that can be managed sustainably with locally available input and family members viz. Integration of fish farming with livestock, poultry, Horticulture, Aquaponics etc. [1,6-10], have emerged out as the effective option to cope with the kind of crisis brought by the lockdown situation in the region.

| Sl No. | Problem faced | Number of respondents | | | Percentage of respondent | | |
|---|---|---|---|---|---|---|---|
| | | Yes | No | No comment | Yes | No | No comment |
| 1 | Problem in management of grow out pond | 128 | 20 | 2 | 85.3 | 13.3 | 1.3 |
| 2 | Problem in marketing of table fish | 140 | 10 | 0 | 93.3 | 6.7 | 0 |
| 3 | Water quality deterioration in grow out pond | 110 | 30 | 10 | 73.3 | 20.0 | 6.7 |
| 4 | Unavailability of inputs for culture | 125 | 25 | 0 | 83.3 | 16.7 | 0 |
| 5 | Mortality/loss of fish | 82 | 55 | 13 | 54.6 | 36.7 | 8.7 |
| 6 | Disease in fish | 28 | 100 | 22 | 18.7 | 66.6 | 14.7 |
| 7 | Lack of transportation | 150 | 0 | 0 | 100.0 | 0 | 0 |
| 8 | Lack of advisory | 100 | 30 | 20 | 66.7 | 20.0 | 13.3 |
| 9 | Manpower crisis | 150 | 0 | 0 | 100.0 | 0 | 0 |
| 10 | Economic loss | 150 | 0 | 0 | 100.0 | 0 | 0 |

**Table 3:** Response of fish farmers regarding problems faced during Lockdown.

Total number of respondents: 150.

This indicates the importance of upgrading the small scale family farming as a means of eradication of hunger in the country where around 25% of world's total hungry population lives and where around 40% of children below the age of 5 years are reportedly suffering from malnutrition. Through responsible planning and intervention of science led technologies for efficient utilization of available resources, the traditionally managed family farming system of Assam can be upgraded as a source for securing balanced nutrition for the family during pandemic like situation and promoted as a model for small scale family farming in the country with suitable location specific modifications for sustainable eradication of hunger and poverty specifically under pandemic situation. Research thrusts need to be put to improvise the traditional homestead family farming as climate smart, sustainable, ecofriendly system through adoption of suitable technology and selection of climate resilient varieties of crops, fish and livestock. Natural feed based fish farming, Biofloc fish farming, Periphyton based fish farming etc. may be viable option to cope with such situation if standardised and improvised to meet the specific agroclimatic condition of the region.

To revamp the sector in post COVID-19 era, steps to be taken to rehabilitate, reorganize, restructure the sector and to mitigate the impact of the lockdown. Government and Non Government Organization should take appropriate steps to provide support for strengthening the sector at different level. Priority should be given to develop and popularize location specific sustainable fish farming systems, climate resilient technology intervention, judicious utilisation of fishery resources, integration with other compatible commodities to reduce risk factor (Figure). Species diversification to cater the consumer preference, standardisation of indigenous techni-

cal knowledge on fish preservation (Chetia Borah, 2019), organised approach, mechanisation, developing efficient fishing tools and gears, developing coping up and mitigation strategy against climate change related challenges, creation of proper storage and marketing infrastructure are important steps for bringing about the desired growth in this sector. Priority should also be given to responsible utilisation of available resources, develop input supply network system, manage the commodity supply chain and strengthen the disaster management system. It is worth mentioning that thousands of youths of Assam, working in other states of the country came back to their home place during lock down after losing their livelihood. Government may plan to train this huge manpower resource for skill development in different field related to aquaculture so that they can engage themselves in this sector for income generation and family nutrition *vis a vis* making the state self sufficient in fish.

**Figure 4:** Small scale homestead family fish farming in Assam.

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